UNPUBLISHED
SURVEY & CONTROL
REPORTS

INTERMOUNTAIN STATION
Central Reference File
No. 3.4163-52

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

MEMORANDUM TO SPOTTERS

BY

J.C. Evenden
Forest Insect Field Station
Coeur d'Alene, Idaho
March 30, 1930

U. S. GOVERNMENT PRINTING OFFICE: 1928 J 76123

FILE COPY
MISSOULA
FOREST INSECT
LABORATORY

Memorandum to Spotters

Control of Mountain Pine Beetle in Lodgepole Pine

The purpose of this memorandum is to outline to the men acting as spotters in connection with this project, their duties, the methods of spotting to be employed, and to present some general information which is hoped will prove to be of assistance. It is impossible to foresee and discuss all of the variations of the problem of spotting which you will encounter in the field, nor is it possible for the officer in charge of the project, or camp manager, to be on the ground with you to assist in the solution of the confusing situations with which you will no doubt be confronted. As much supervision and instruction will be given you as is possible. The officer in charge of the project, camp manager, officers of the Bureau of Entomology, etc., will visit you as often as possible, but there will be times when it will be necessary for you to make immediate decisions on the ground, and in such cases the responsibility will rest directly upon the chief spotter. When your best efforts are employed in making such decisions that is all that can be asked of you.

In all forest insect control projects, spotting is the first and most important step of the operation. The task of spotting is to locate the infested trees for the treating crews. A large per cent of the infested trees which are missed by the spotters will remain untreated, leaving a potential source of reinfestation within the area, which often defeats the purpose of the project. In addition to the potential danger of such trees, and after the project has been put to the expense of establishing a camp within an area it is economically essential that all infested trees within the area covered

by the survey be marked for treatment. In brief, then, it is the duty of the spotters to locate, tag, and map, as efficiently and economically as possible, all infested trees within the areas assigned to them. It may prove expedient to allow some small isolated trees to go untreated, if they are remote from the activity of the control crews. However, the responsibility for such eliminations, or decisions will rest with the camp manager, and not the chief spotter.

Accountability of Spotting Crews

Spotting crews are a part of the regular camp organization and are responsible to the camp manager. They will be expected to assist in the moving and establishment of camp, and in all other duties of the camp organization. The chief of spotters will deal with the camp manager relative to the assignment of areas to be spotted, forms, reports, and supplies.

Methods of Spotting

The general method of spotting to be employed should be a 100 per cent survey, and it is believed that this method will be necessary for a large per cent of the lodgepole pine stands under consideration. However, it is often feasible, as well as advantageous, to vary this method to meet other conditions when encountered.

All large or solid bodies of lodgepole pine should be covered by a 100 per cent survey. The size of spotting crews that will be found most efficient, will vary with the nature of the terrain being covered. In normal lodgepole forests a five-man crew gives the best results. A larger crew is too unwieldy and can not keep in contact with the compass man, or guide of the party, and a three-man crew requires an additional compassman, with no greater amount of territory being

covered. A five-man crew will under ordinary conditions cover as much ground as two 3-man organizations and the expense of one compassman is eliminated. In extremely rough and brushy country a 3-man crew might prove more efficient, though it is doubted.

Spotting crews operate, by gridironing a section, or block of timber, traveling on a definite compass line. Trails, roads, streams, ridges, etc., can be used for base lines when spotting is being conducted in unsurveyed country, or where the timber type is broken up into narrow belts or small blocks. As the direction of a strip is reversed the spotter who was on the outside should go back on the inside of the new strip. As he is familiar with the country covered he can assure himself that no gaps have been left between the two strips. As strips cross main trails or roads, it is a good plan to fasten a tag showing the number of the strip to a tree or stump. The strip can be identified from spotter's maps and such information often proves to be of assistance to treating crew foremen in relocating marked trees. No# This method of spotting can be adapted to meet all conditions encountered.

In the adoption of this method it is not necessary to cover a lot of timberless territory when types are encountered that are broken up into small blocks or strips. Each block of timber can be worked independently, the strips starting from some local point such as a bridge, gate, etc., so that the map can be accurately prepared.

It is possible that in working a narrow, meandering belt of timber it might be advisable to forego the running of a compass line. However, the same formation of spotters should be followed, only the guide would be the man covering the outside strip instead of the center man.

If this guide is to the right then each spotter should conform to the direction being followed by keeping the proper distance away from the man to his immediate right. In this way each man becomes a guide for the man to his left. A better alignment and proper distances are maintained if the line of spotters is staggered or echeloned to the rear. To accomplish this each spotter should walk a few paces behind a line perpendicular to the course which the man who is acting as his guide is following. This is also true when a compass line is being used, and the guide is in the center of the formation. Under such an organization the crew assumes the shape of an inverted V with the compassman at the apex. When no compass line is used and it is necessary that two or more strips be run to cover the area, it is essential that the inside man mark his line in some way so that on the return trip he can follow it correctly in order that none of the area is missed. Though it may be found expedient to abandon the compass under certain conditions, it will still be necessary in practically all cases to pace the distance traveled. This data is essential for the proper location of the infested area on the spotter's map, in order that the trees marked for treatment can be relocated with a minimum of effort on the part of the treating crew foremen.

It is difficult, in fact impossible, to visualize all types of conditions in order to offer tentative solutions. As stated it will often be necessary for chief spotters to make immediate decisions upon the ground. If one bears in mind that the task of spotting is the <u>location</u> of the infested trees for the treating crews, there will be no question but that such decisions will be correctly made. A method of spotting which does not <u>locate</u> such trees so they can

be relocated with the least possible effort is in most cases an improper one to use. Good business judgment must of course be considered in making all decisions in order that spotting will not be carried to an unwarranted extreme.

The chief of party, or chief spotter, will be responsible for the compass work, the pacing, construction of a map showing the number and location of all infested trees, and the proper selection of the insect-attacked trees for treatment. With all isolated or small groups of infested trees the D.B.H. or average D.B.H. of the group will be shown on the map in addition to the location, and tree numbers. Each spotter will be responsible for the location and marking of all infested trees within a strip one chain wide on one side of and parallel to the course of the compass man. It is possible that the width of this strip could be increased for open stands of timber. Each infested tree will be marked with a white tag of cloth or paper, on which will be written with lumberman's crayon the crew symbol and the tree number. Each spotter will carry his own supply of tags on which he will have previously placed the crew symbol about an inch from the top and his initials in the lower right-hand corner. When an infested tree is located the spotter will ask the chief of party for a tree number which he will write upon the tag. The tags are fastened to the tree with a tack in each upper corner. When groups of infested trees are found all of the spotters will assist in the marking, each one securing a number from the chief of party as each tree is located. If a group of infested trees extends off of the strip being covered, all of them will be marked at that time, regardless of their location. The chief spotter, in addition to the map will keep such other records as are required by the officer in

charge of the project.

It is possible that in areas where it is found that the infestation is of sufficient intensity, the task of providing a control crew with infested trees will be assigned to one man. In such cases the duties of this man will be to locate all of the infested trees in the section assigned to the control crew. It will be necessary for him to provide the crew foreman with suitable maps showing the location and number of the infested trees. Trees will be tagged in the same manner as outlined for the spotting crews. It will also be necessary for this spotter to keep such other reports as required by the officer in charge of the project. This method is applicable for heavy infestations where one man can take a small area and by constantly working through it he can locate all of the infested trees, which in such situations usually occur in large groups.

During very early seasons it is possible that in June the foliage of infested lodgepole will be faded to a degree that will permit the adoption of a topographic method of spotting. In the employment of this method of spotting the foliage is used entirely as a guide to the infested trees. The method is only applicable in regions where the infested trees show discolored foliage. The infested trees are first spotted, from opposite hillsides and all other advantageous lookout points, and their approximate location placed upon a map. The trees spotted in this manner are then visited by the spotter, examined, marked for treatment, and their location carefully checked on the map. In regions where the terrain lends itself to this method of spotting it is possible for one or two men to adequately cover large areas very efficiently and economically.

Importance of Spotting

In considering the importance of the actual spotting of infested trees there are two phases which must be considered. These are the importance of locating all of the infested or attacked trees within an area, and the proper selection of them for treatment after they have been located. Of the two, the latter is the most complicated. The location of infested or insect attacked trees is but a mechanical operation which, if one is alert, can be made nearly 100 per cent effective. With the problem of determining if a tree which shows the external signs of a bark beetle attack should be marked for treatment, more serious difficulties are involved.

The insect we are combating is known as the mountain pine beetle (Dendroctonus monticolae), which attacks and kills healthy mature western white pine, western yellow pine, lodgepole, sugar pine, white-bark pine, and sometimes Engelmann spruce when in close association with infested pine. The adult insects are rather stout, black, cylindrical barkbeetles, varying in length from 3½ to 6½/25 of an inch. These beetles bore through the outer bark and construct long perpendicular egg galleries directly beneath the bark, which slightly groove the wood and extend up the tree. At the bottom or start of these egg galleries, which vary in length from 12 to 30 inches, there is normally a slight crook of an inch or more that starts at the entrance hole. Eggs are deposited along this gallery which soon hatch into small white grubs or larvae. In feeding, these larvae excavate individual

larval mines at right angles to the egg gallery, which vary in length and width, and are exposed on the surface of the inner bark. When mature the larvae constructa small cell at the end of the larval mine in which the transformation to the new adult takes place. During this transformation the insect goes through what is called the pupal stage, and the small cell is termed a pupal cell.

When the transformation is complete the new adults bore away the intervening bark between cells and congregate beneath the bark for some time before emergence, or they may bore emergence holes directly out from the pupal cells. When emerging after congregating several insects may use the same emergence hole, or quite often advantage is taken of cracks in the bark, woodpecker work, etc.

Location of Insect-infested Trees

Insect-attacked trees are first located by the presence of small pitch exudations (pitch tubes) which form at the mouth of the entrance hole, or by the boring dust at the base of the tree. Pitch tubes are not always present. When the attack is extremely heavy there are very few, if any, to be seen, so one cannot depend upon this rule as an infallible guide. This is easily explained by the fact that the total flow of pitch is distributed through so many entrance holes that there is not sufficient to form tubes. On the contrary when the attacks are light, the flow of pitch is so strong through the few holes that the attacking beetles are washed from their galleries and the attack is unsuccessful.

Large pitch tubes are usually, though not always, an indication of pitched-out attack. Fresh woodpecker work is a true indication that there were and possibly are insects beneath the bark. However, it does not prove that the insect is the mountain pine beetle.

In marking lodgepole pine for treatment one will often be called upon to determine between the work of the mountain pine beetle and different species of Ips. The best plan to follow is to familiarize oneself with the characteristic gallery pattern of the mountain pine beetle, and to disregard all others. A point to be remembered is that the egg gallery, or main channel of mountain pine beetle work is always packed solid with sawdust, except for an inch or two at the upper end, while with Ips this gallery, which is often forked, is kept free from sawdust. Later in the season the foliage of the infested trees begins to fade, which can be used as a guide to infested groups.

There is no infallible rule which can be given to you for the proper marking of infested trees from external evidence. The rules which have been listed will lead you to the tree that has been attacked, then it is for you to determine if it should be marked for treatment. It will be necessary for you to examine nearly every tree by removing a piece of the bark. If you find that the tree was killed by the mountain pine beetle and that there are sufficient insects beneath the bark, then it should be marked for treatment. By insects we mean the developing broods resulting from the parent adults of the mountain pine beetle which attacked the tree the previous summer. These may be as larvae, pupae, or new adults.

The parent adults you will find in the top of the old egg gallery. Normally they will be dead, but do not mark trees for treatment on the strength of these old black parent adults, for even if alive they carry very little if any, potential danger to the green trees adjacent. The new adult will vary in color, appearing first as pure white to brown and then to dark black prior to emergence.

It is in the marking of trees for treatment which show external evidence of attack that the good judgment of the spotters must be called upon. In this connection it is necessary that the spotters have a general idea of the seasonal history of the mountain pine beetle. The manner in which this insect works has been described to you so that in a very short time you can determine if the tree has been attacked by this insect. However, it must then be determined if the insect broods are still present beneath the bark before the tree can be marked for treatment, as it is very obvious that there would be little accomplished by treating trees from which the beetles had emerged.

In lodgepole pine, though there is but one generation of the mountain pine beetle per year, an overlapping of the broods does sometimes occur during long seasons causing confusion to the spotters. Normally the insect passes the winter as a larva which matures into a new adult during the latter part of June and July. Emergence occurs during the latter part of July and the new attacks take place in August. However, deviations from this rule are often encountered.

Another complication which may be encountered is when the attack only exists on one side of the basal portion of the tree. Infested trees of this character are often missed by the spotters

passing by the unattacked side of these trees, but the most serious complication or confusion which will arise from these trees is when the uninfested portion of the tree is attacked later in the season, or the following season. This results in the spotters finding insect broods in this basal portion of the tree when the insects have emerged from the remainder. With a little practice these trees can be easily determined, and properly marked.

Instructions will be submitted by the officer in charge of the Project relative to the forms which are to be prepared and submitted by the Chief Spotter, method of marking trees, maps etc.

James C. Evenden
Entomologist

Approved
C. B. Morse
Assistant District Forester